THE UNIVERSITY OF WASHINGTON

Arboretum *bulletin*

FALL
1966

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Arboretum bulletin

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COVER PHOTO:

Fruits of *Camellia japonica* 'Lotus'

PHOTO BY: E. F. MARTEN

A Letter from the President

To the membership of the
Arboretum Foundation

As the new President of the Arboretum Foundation, I am glad to write you this letter and to chat with you briefly about the Foundation. Seattle today is blessed with many cultural assets of which we may all be very proud: Milton Katims' Symphony; Dr. Fuller's Art Museum; the Performing Arts of the Civic Center; the University's Arboretum. Each of these serves a serious purpose and fulfills a great urge in the hearts and minds of the people of the Northwest. Together they make a whole city culturally.

A few years ago, the Arboretum did not hold a place of such importance in Seattle. It was then that the Foundation was formed by enthusiastic citizens of Seattle to help improve and develop the Arboretum. During the years, thanks to the efforts of many dedicated women and the cooperation of the administration heads of the University of Washington, the Foundation has done a good job and the Seattle Arboretum has become an important civic asset.

The Foundation is a tax exempt organization. It has four main sources of income: gifts, bequests and dues, and the proceeds of the Annual Plant Sale. These sources have produced an increasing amount of income over the years. Last fiscal year (May 1, 1965-April 10, 1966) our total receipts were $63,951.07 and our disbursements were $36,354.61. The breakdown is as follows:

On hand April 30, 1965	$134,541.34
INCOME	
Bulletin	$ 1,217.37
Donations	3,473.05
Floral Hall Donations	10,685.20
Dues	23,195.00
Education Program	1,525.19
Memorials	1,200.00
Unit Council Activities (including Plant Sale)	15,693.93
Office Miscellaneous	437.45
Special Projects	124.00
Floral Hall Furnishings	560.00
Income from Trust Fund	664.45
Bank Interest (Savings)	5,038.93
Increase in Petty Cash Fund	17.00
Miscellaneous	1.50
Japanese Garden	118.00
Total	$ 63,951.07

EXPENSES	
Education Program	1,280.00
Membership	1,644.35
Miscellaneous	709.37
Publicity	660.00
Salaries	10,800.00
Telephone	291.79
Unit Council Expenses (Including Plant Sale Material, Upkeep of Greenhouse, Etc.	9,775.96
Donations transferred to University	3,945.75
Cost of bringing witness from Chicago to testify at Thomson Freeway hearing	284.34
Social Security	310.02
Bulletin	5,085.33
Office Insurance	102.00
Donation to Assistant Director of the Arboretum for trip	700.00
Memorials	280.70
Christmas Gifts	385.00
Auditor	100.00
Total	$ 36,354.61
Cash on hand April 30, 1966	$162,137.80

The distribution of the cash on hand as of April 30, 1966 is as follows:

General Fund	$ 47,921.23
Unit Council Fund	23,255.49
Floral Hall Fund	78,588.74
Memorial Fund	11,960.63
Rhododendron Fund	209.21
Japanese Garden Fund	167.50
Petty Cash	25.00
	$162,137.80

In addition to the foregoing there is $14,968.16 in an Endowment Trust Fund of the Seattle-First National Bank, the income of which is paid periodically to the Foundation.

The Unit Council is an integral part of the Foundation. Its main activity is the holding of the Annual Plant Sale. This activity is most important. It not only produces cash to operate our facilities in the Arboretum and to contribute directly to the needs of

the Arboretum but it is the catalyst of the whole Foundation operation. It brings the members together in a common interest. It builds up the morale, the spirit and the enthusiasm. It has become a traditional event over the past years. The proceeds of the Plant Sale built the Clubhouse and maintain it. They constructed and operate the greenhouse. In order that the membership may be informed with the use to which the proceeds have been put, the following is a (10) year breakdown.

	1956 1957	1957 1958	1958 1959	1959 1960	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965	1965 1966	TOTAL
Council Expense	44.85	35.08	58.66	62.22	50.94	55.31	134.16	123.38	130.79	136.92	832.31
Qtrly News etc. Speakers, gifts	155.07	100.00	63.37	102.46	66.64	15.60	30.64	60.39	55.00	45.00	694.17
Clubhouse											
Equipment	172.11	443.54	306.26	12.17	59.01	54.12	7.13	67.87	70.46	5.00	1197.67
Electricity	33.06	39.95	43.50	47.88	46.99	30.96	48.99	45.82	59.44	64.26	460.85
Cleaning-Upkp	208.51	133.50	132.78	198.50	205.34	129.00	188.00	162.00	318.94	397.23	2073.80
Insurance	27.30	41.22	41.22	41.22	61.42	59.90	61.97	63.13	62.00	45.00	504.38
Expended for Specific Arboretum Projects	2487.16	13.22	254.17	1741.28	130.00	614.97	2555.46	2477.65	1264.24	1705.46	13243.62
Direct to University for Arboretum use	1469.60	770.00		500.00	200.00			189.28	1500.00	1380.00	6008.88
Greenhouse			4196.64	1906.49	504.91	753.17	578.23	510.82	736.06	826.78	10013.10
	4596.66	1576.51	5096.60	4612.22	1325.25	1713.03	3604.58	3700.34	4196.94	4605.65	35028.78
Savings						8000.00	2000.00	5500.00	5000.00		20500.00
	4597.66	1576.51	5096.60	4612.22	1325.25	9713.03	5604.58	9200.34	9196.94	4605.65	55528.78

(Continued on Page 78)

Arboretum Report

SEPTEMBER, 1965—JULY, 1966

B. O. MULLIGAN

Maintenance and Improvements

The program of removing sick, weakly or undesirable trees and clearing out unwanted native shrubs, especially nut bushes (*Corylus californica*) and the red osier dogwood, from various areas was continued during the fall and winter, notably near the northern tip of Foster's Island and in the Holly area west of Arboretum Drive. The Winter Garden was thoroughly weeded and mulched with wood shavings, and the steep bank immediately east of the lookout also cleared of blackberries and thimbleberries (*Rubus parviflorus*), then heavily mulched with partially decayed leaves in preparation for later planting. In the Japanese garden, five dying native big-leaf maple trees were carefully removed. The young trees along the Boulevard were again pruned early this year.

In October, two of our four ponds were dredged and cleaned of much weed and accumulated rubbish; one at the lower west end of Rhododendron Glen, by Azalea Way, the other at the east end of Woodland Garden.

Two new tile drains were laid on or beside Azalea Way, one on the east side just north of the *Ceanothus* collection, about 150 feet in length, the other a more complex system at the north end, 240 feet in length, to try and improve an increasingly wet area. Drainage problems in the Arboretum are numerous and will only be overcome gradually as time, labor and materials are available for the work.

The cherry trees on Azalea Way (forms of *Prunus subhirtella*) were sprayed four times between November and May in an effort to get better control of the serious bacterial wilt disease. A copper sulphate spray was used in the dormant season, Puraspray in the spring. Dead twigs and branches are also systematically removed during the summer. If it were not for this program, our trees would probably not

survive very long, although it is not by any means 100% effective.

Another effort to control weeds, especially horsetail (*Equisetum*) in Rhododendron Glen and on Azalea Way, and coarse grasses around the lilac bushes and mountain ash trees has been more successful, by applying Casoron in the fall or spring. We are planning to do this on a larger scale in the near future, since horsetail has been one of our major weed problems for many years.

The heavy wet snow which fell just before Christmas (eight inches were recorded at Seattle-Tacoma Airport on Dec. 23) caused considerable damage to camellias, Japanese cherries, and especially to the native vine maples (*Acer circinatum*) of which many large branches bowed over by the weight of snow had to be removed.

Five new benches made here from our own cedar logs and mounted on concrete footings have been placed on Azalea Way, in the Winter Garden and elsewhere. The labelling program has been prosecuted with vigor since we added a man to our staff in August, 1965, primarily for this purpose. Such areas and collections as Rhododendron Glen, Azalea Way, the camellias, hollies, oaks, spruces, mountain ashes and crab apples have been thoroughly checked and relabelled as necessary.

New Plantings

Because of the mild wet weather experienced in November, December and January (19.73 inches of rain in three months, minimum temperatures of 26° F. on Dec. 15 and 27° F. on Jan. 24) we were able to continue planting almost without a break from early October to the middle of May—more than seven months—although the late plantings have to be watered regularly thereafter. In all, 917 plants of 266 kinds were set out; few large plantings, but many small groups or individual plants to fill in vacancies in particular places. One of the most notable was a group of various Japanese cherries placed behind the pond near the south end of Azalea Way. These we hope will add much to our spring display in that area in the future.

Nine new kinds of hollies were placed in the collection, including the Japanese species *Ilex rugosa* and *I. Sugeroki* and yellow fruited forms of the American holly, *I. Opaca.* Some older plants, forms of *I Aquifolium,* were transplanted to give them more room to develop. Nine plants of various kinds of *Viburnum* were added to the collection, six species of birches, including three from central Asia, placed on Foster's Island, and two more of Japanese origin in the Japanese Garden. To the Winter Garden we added nine plants of *Camellia Sasanqua* and two *Hamamelis;* to the rock garden in April a collection of *Penstemon* species and hybrids; a new planting of *Rosa* species (17 kinds) was made beside the service road in the nursery, in order to preserve stock material for the future, and finally a considerable planting of pines (31 plants, representing eleven species or varieties) and of *Ceanothus* (30 plants, of four kinds) was made in April and May respectively on the strip of land between Hamlin Street E. and the approach roads to the second Lake Washington bridge, which is still maintained by the University.

Acquisitions

(a) *Plants, Cuttings, Scions*

Notable amongst these was a large collection of heather cuttings, sent by Mrs. David Metheny from the John F. Letts nursery in Surrey, England. Nine different forms have been rooted, all new to our present collections. Seventeen trees of Japanese cherries were purchased from Mrs. Rudolph Henny, Brooks, Oregon, and have been planted along or near to Azalea Way. Twelve large plants of shrubby peonies were given us by Mr. H. E. Donart, of Capitol Hill, Seattle, and were placed in the Japanese Garden. Five others were purchased from Miss Saunders, Clinton, N.Y.

The Morton Arboretum, Chicago, sent scions for grafting of seven forms of the Colorado spruce; a new *Ceanothus* hybrid,

'Far Horizons', came from the Santa Barbara Botanic Garden for trial here, and three new named clones of sweet gum (*Liquidambar Styraciflua*) from the Saratoga Horticultural Foundation, California. We imported a small collection of eight new hybrid Camellias from one English nursery and an assortment of camellias, hydrangeas, and other shrubs from another. The Oregon Bulb Farms (Mr. Jan de Graaff) generously presented us with some 2100 lily bulbs of seventeen kinds. These have been flowering in various parts of the Arboretum this summer. From the U.S.D.A. Plant Introduction Station, Glenn Dale, Md., we received in April fifteen kinds of young trees and shrubs, chiefly raised from seeds or cuttings collected in Japan by Dr. J. L. Creech in 1961. An additional small collection of azaleas and rhododendrons came from the same source in May.

(b) *Seeds*

During the first six months of 1966 274 packets were received from a large number of sources all over the world, including arboreta or botanical gardens in England, France, Germany, Switzerland, the U.S.S.R., Japan, Chile and New Zealand, as well as in the United States and Canada, including the U.S. National Arboretum at Washington, D.C. Some particular items were *Rhododendron* seeds collected in the eastern Himalaya by the Peter Cox expedition (17 packets), from Japan by K. Wada and some personally collected by Frank Doleshy of Seattle (11 packets); five species of native trees (three *Nothofagus*) from the University of Chile, Santiago, and twelve trees and shrubs from the Municipal Arboretum, Kobe, Japan.

(c) *Books*

Some of the volumes acquired by gift, purchase, or sent for review during the past ten months have been: *The British Flower Garden*, by R. Sweet, 6 vols., (1823-35), gift of the Bloedel Foundation; *Illustrations of Ligneous Plants of Taiwan*, by T. S. Liu, 2 vols., (Taiwan, 1960-62); *Magic of Trees & Stones*, by K. Saito and S. Wada, (Tokyo, 1964), given by Unit #70; *Flora of Japan*, by J. Ohwi, in English, by Dr. F. G. Meyer and E. Walker (Washington, D.C., 1965), from Unit #41; *Trees For American Gardens*, revised and enlarged edition, by Dr. Donald Wyman, (New York, 1965); *Manual of Cultivated Conifers*, by P. den Ouden and Dr. B. K. Boom, (The Hague, 1965), gift of J. Spaargaren, Seattle; *Climbing Roses, Old & New*, by G. S. Thomas, (New York, 1966). Truly a varied and useful assortment, reflecting the range of plant material growing or likely to be grown here.

(d) *Principal Other Gifts and Acquisitions*

From the Arboretum Foundation, for Cushman Truckster, $2,200.00; for Mr. Witt's tour in England, $700.00; for memorial cherry trees, $150.00. From Arboretum Unit Council, for Mr. Witt's tour, $700.00; for summer maintenance, $500.00; for hire of chipper, $180.00.

From Seattle Garden Club, for maintenance	$500.00
From West Seattle Garden Club, for Woodland Garden	150.00
From Mercer Island Garden Club, for Winter Garden	100.00
From the Faculty Wives Garden Club, for memorial book	45.00
From Unit #19, for new plants	80.00
From Unit #25, for Woodland Garden	100.00
From Unit #29, for labels	64.00
From Unit #32, for photographic equipment	106.00
From Unit #33, for any purpose required	185.00
From Unit #35, for any purpose required	185.00
From Unit #36, for memorial books	50.00
From Unit #41, for any purpose required	175.00
From Unit #47, for any purpose required	50.00
From Unit #52, for any purpose required	118.50
From Unit #52, for signs or labels	250.00
From Unit #70, for signs or labels	70.00
From Unit #73, for any purpose required	100.00

In January we purchased for $200.00 a new 24 inch chain saw, with funds given

by Unit #41 in 1965. Many other smaller donations from Arboretum Units or Garden Clubs are omitted for lack of space but nevertheless all are welcome and received with appreciation.

A new Massey-Ferguson tractor, together with loader (66 inch) and 8 ft. wide terracing blade, was acquired with funds from our own budget in Dec., 1965.

Plant Material Distributed

In September, 1965, we offered 36 different kinds of young plants to many other similar institutions in the U.S., including five *Cupressus*, three *Eucalyptus*, *Acer morrisonense* from Taiwan, and others. As a result, fifteen consignments were sent out in October, totalling 142 plants. Other sendings included twelve seedlings of our western dogwood (*Cornus Nuttalii*) to Dublin for the Kennedy Memorial Arboretum now being developed; a collection of twenty different kinds of trees and shrubs to the new Experimental Forest of Southern Illinois University, scions of three native *Sorbus* species to the Morton Arboretum, Lisle, Ill.; plants of six hybrid rhododendrons raised here to the Royal Botanic Garden, Edinburgh, Scotland, and of the form of *Cupressus macrocarpa* named 'Golden Pillar', which we originally obtained from England, to a nursery in New Zealand. We were also able to return the white fruited form of *Skimmia japonica* to Mr. K. Wada in its country of origin, Japan.

The annual spring seed distribution was again most competently handled for us by members of Unit #25. The total number of packets mailed this year was 2773, to 202 institutions or correspondents, compared with 4821 packets to 204 in 1965, and 3222 to 161 institutions in 1964. The most popular items were two native trees, the rare alpine larch (*Larix Lyallii*), the Pacific silver fir (*Abies amabilis*), followed by a Japanese maple (*Acer Shirasawanum*) and the Chinese *Pinus tabulaeformis*.

Educational

In the nine months, 32 talks, generally illustrated by slides, were given to garden clubs and other groups by the Director and Assistant Director. 33 sets of slides were loaned to other speakers at such meetings. 180 new slides have been added to our comprehensive selection since Sept. 1, 1965. Twenty group tours were conducted and five pruning demonstrations given. Mr. Witt conducted a class in January and February on the identification of conifers, two hours weekly for six weeks. This was attended by 24 persons.

Both the Director and Assistant Director attended the regional meeting of the International Shade Tree Conference at Spokane, March 18-20, and took part in the excellent program.

Telephone inquiries for information in 1965 totaled 2244, a very small increase over 1964 (2223). A new printing of our information leaflet, slightly revised, was made in May.

Mr. Witt spent three weeks in England and Scotland in June, on a professional horticultural tour arranged by the New York Botanical Garden, visiting public and private gardens, nurseries and parks. As the list of donations indicates, this was generously supported by the Arboretum Foundation and Unit Council, to whom our warm thanks are again expressed.

Japanese Garden

Total attendance in 1965 was 42,480 persons, compared with 42,190 in 1964, 41,150 in 1963. Expenditure on the garden (chiefly for the gardener, gatekeepers and lighting) has risen faster than attendance, from $3480.56 in 1963 to $4746.79 in 1964, and $5440.96 in 1965.

For the first half of 1966, attendance has totaled 22,161 persons, expenses $2936.41. Both show increases over 1965.

Staff Changes

Following the sudden death of the nursery foreman, Kamuela Stevens, in February, Esiquio Narro was appointed in his place, having previously had ten years experience in maintenance and planting work on the University of Washington campus.

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The Strybing Arboretum and Botanical Garden of Golden Gate Park, San Francisco, California

P. H. Brydon*

The Strybing Arboretum and Botanical Garden is owned by the City and County of San Francisco and operated by the Recreation and Park Department. It is located in Golden Gate Park, and borders Lincoln Way between 9th and 19th Avenues. The Arboretum was made possible by a bequest from the late Helene Strybing and had its beginning in 1937 when John McLaren, the creator of Golden Gate Park, appointed Eric Walther as its first Director. What was once a barren stretch of sand dunes is now a sixty four acre Arboretum including over 5000 species from all over the world.

In 1960, a master plan indicating major roadways and topographical changes was designed by landscape architect Robert Tetlow. The first phase, completed in 1963, provides a new main gateway and several new areas which have been planted recently. One of the most popular is the Strybing Arboretum-Sunset Magazine Demonstration Home Gardens which is contained in a two acre enclosure to the right of the main entrance. The purpose of these gardens is to help home owners by demonstrating construction, landscape, and planting ideas and constitutes a twelve month display. It is planned to permit seasonal changes in plantings and structures and demonstrates the best use of plants ideally suited to the climate of San Francisco. The gardens also serve as a showcase for new introductions by the Arboretum and horticultural establishments in the San Francisco Bay area. (Fig. 11).

Proceeding into the Arboretum from the Demonstration Gardens, a fountain is visible in the distance against a dark background of Monterey Cypress (*Cupressus macrocarpa*). To the left, protected from prevailing winds by tall Monterey Cypress and Monterey Pines (*Pinus radiata*), is a long deep border containing a representative collection of the Magnoliaceae. in addition to the spectacular oriental magnolia species such as *M. campbellii, M. sargentiana robusta, M. sprergeri* 'Diva', *M. dawsoniana,* and the hybrid *M. x veitchii,* there are interesting relatives such as *Talauma hodgsonii, Michelia doltsopa, M. figo, Illicum anisatum, I. floridanum, I. parviflorum, Liriodendron tulipiferum, Kadsura japonica, Drimys winteri, D. lanceolata,* and *Manglietia insignis,* one of the most primitive of the flowering plants.

Nearby, and on either side of the fountain, is a collection of some thirty-five varieties of flowering crabs which provides a continuity of color to the earlier magnolias. They have grown vigorously and our favorites include three new ones which have done especially well. They are *Malus* 'Tanner' a dwarf double white, *Malus* 'Gorgeous' a wide spreading grower with large double white flowers flushed pink followed by lovely pink cheeked crab apples, and *Malus* 'Mary Potter' a graceful slender tree with delightful light pink double flowers.

Across the way, is the recently completed Garden of Fragrance which has been constructed for the recreational benefit and enjoyment of the visually handicapped. For them, the plants on display offer special sensory experience by their texture and fragrance. The statue of St. Francis, at the head of the water course is the work of San Francisco sculptress, Clara B. Huntington. This statue was featured in the courtyard of the San Francisco pavilion at the 1939 International Exposition on Treasure Island. The stones with which the walls and water course are built were salvaged from the 13th Century Spanish monastery, presented to San Francisco by Wm. Randolph Hearst in 1941. (Fig. 12).

The recently completed second and final

*Mr. Brydon is Director of the Strybing Arboretum.

phase of the master plan is the "key" to a multitude of activities which have been pending. The staff can now proceed with permanent plantings of new accessions which have been held in our nursery until suitable locations were made available. New vistas have been created leading to points of interest and orienting visitors who until now, have been confused as to the direction of entrances and exits. Apart from the removal of undesirable brush, and a realignment of main roads, there has been little change in the older part of the Arboretum where a geographical arrangement is still maintained.

In the Australian section, the Lilly Pilly tree (*Acmena smithii*) 35 feet tall, charms with its masses of light purple fruits in April, May and June. Close by, the curious brown flowers of *Boronia megastigma,* fill the air with heady fragrance. In nearby South Africa, a sizable specimen of the Silver Tree (*Leucadendron argenteum*) some 30 feet tall, is lovely against a blue summer sky. Down the path in the Chilean section, *Puya chilensis,* one of several species in our collections, sends up its huge "asparagus stalks" to fourteen feet and bears four foot inflorescences of greenish yellow flowers in April and May. The principal trees in this section are the *Maytenus boaria, Araucaria araucana, Nothofagus procera, Eucryphia cordifolia,* and *Drimys winteri,* some of which were planted in 1938 shortly after the opening of the Arboretum.

Along the main axis, which bisects the Arboretum below the Chilean section, are some spectacular specimens of the Torrey

Entrance to Strybing Arboretum—Sunset Magazine Demonstration Home Gardens.
Fig. 11—Photo by: E. W. Marugg

Pine (*Pinus torreyana*). The largest one has a trunk circumference of 43 inches at 2 feet above ground level and is now 60 feet tall.

To the west of the main axis is the China, Japan, Himalaya section and here the staff is presently engaged in extensive thinning and removal of undergrowth and a few trees which, because of close planting, are no longer significant as plant specimens. The 35 foot Dove Tree, (*Davidia involucrata*), never fails to attract attention in late April when it is covered with its white fluttering bracts so reminiscent of doves, or pocket handkerchiefs. It has some illustrious neighbors in *Magnolia campbellii alba,* 45 feet tall, *M. campbellii* 'Strybing White', 60 ft. tall, and the original imported plant of *M. campbellii* which came from Stuart Low in England in 1924 and was probably the first of this species on the West Coast.

One of the conditions of Mrs. Strybing's bequest was that the Arboretum contain plants native to and characteristic of California. Consequently, five acres have been devoted to native plants and over 420 species are displayed in the recently installed California section. Within its boundaries is a small grove of coastal redwood (*Sequoia sempervirens*) called the Redwood Trail which has been designed as an area for the study of the unique flora of our coastal redwood forests. It contains about one hundred and fifty species of native plants which grow in association with the red-

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Visually handicapped children enjoying the Garden of Fragrance, illustrating the 13th Century Spanish monastery wall, the Braille labels being used by the children, and the water where they wash off the various scents as they "read" each herb.
Fig. 12—Photo by: P. H. Brydon

Biological Research at the University of Washington College of Pharmacy

Lynn R. Brady*

Pharmacognosy is the branch of pharmacy which is concerned with drugs obtained from nature. Nature yields a large number of diverse materials which are used in medicine, and it is interesting that almost 50 per cent of the prescriptions written in this jet age are for medicines which contain one or more natural products. Most of these drugs are obtained from the plant kingdom and have a long history of utilization in organized medicine. However, since the end of World War II major developments have been achieved in detecting new plant constituents with therapeutic efficacy and in using microorganisms to produce medicines.

Pharmacognosy encompasses a very broad scope. It includes such factors as recognizing plants which are of potential medicinal importance, determining the availability of reliable sources of the plant material, and studying such factors as breeding, cultivating, harvesting, and processing the natural material. Production of an adequate supply of effective drugs at the lowest possible cost is the ultimate objective. Basic knowledge in various aspects of biochemistry, botany, chemistry, genetics, and geography is applied in pharmacognostic research. Normally, individual research programs tend to specialize in selected aspects of the broad discipline. Several factors, including a long history of activity in this field and favorable climatic conditions, have made the University of Washington an acknowledged leader in the investigation of plant drugs, and the activities at the University are more varied than those found in most colleges of pharmacy in the United States.

The Drug Plant Gardens

The Drug Plant Gardens maintained on campus by the College are the largest diverse planting of their type in the United States. Some of the plant material is utilized in a search for chemical constituents which may be of value in medicine. Data are also accumulated on the growth requirements for the infrequently cultivated species. However, the Gardens' most significant contribution to science is probably an active seed exchange program. Seeds are exchanged with other gardens and investigators located in almost every country in the world. Many plants of interest as potential drugs are considered weeds by gardeners, and the scientists frequently find that obtaining the desired plant material is a major problem which must be solved prior to initiating their laboratory investigations. An indication of the scope of the University's contribution in this area is shown by the more than 1500 seed requests which were filled in each of the past two years.

Investigations of Higher Fungi

The research program in pharmacognosy at the University in recent years has concentrated primarily on the higher fungi. The decision to investigate this group of plants was prompted by the unusually large mycological flora in Western Washington, the reported toxicity of many different mushrooms, the lack of reliable scientific data on the active chemical constituents in most fungi, and the availability of excellent taxonomic counsel in the Department of Botany. The objectives of the research are to search for new compounds with useful therapeutic properties, to determine the principles responsible for the toxicity of various species, and to conduct selected basic studies on the biology of the fungi. Very few research groups have directed their attention to these problems, and this program lends an unusual feature to the University's total research efforts. The Uni-

*Associate Professor of Pharmacognosy

versity has received appreciable financial support for this program during the past six years from the National Institutes of Health.

Muscarine

Muscarine is a very potent fungal metabolite which has been used to characterize a basic type of physiological response in zoological systems. A bioassay procedure and two chromatographic techniques have been developed for evaluating the occurrence of this compound in mushrooms. These methods were employed in a study of more than thirty *Inocybe* species occurring in the local flora. Most of the *Inocybe* species were found to be poisonous; *I. decipientoides*, *I. griseolilacina*, *I. lacera*, *I. mixtilis*, and *I. napipes* were shown to be particularly dangerous. Studies contributing to the elucidation of the physiology and biosynthesis of muscarine in *Inocybe* species have also been conducted.

Ibotenic Acid

Considerable attention has been devoted to the genus *Amanita*. Many members of the genus are known to be poisonous, but there is little agreement in the pre-1965 literature regarding the nature of most of the toxic principles. A systematic chemical examination of *A. muscaria* and *A. pantherina* from Western Washington established that earlier reports on the occurrence in these species of atropine-like compounds were incorrect, and, recently, Japanese and European investigators have confirmed this by demonstrating that the active compound is ibotenic acid. An examination of the distribution of ibotenic acid in American *Amanita* collections has shown that the acid appears to be restricted to *A. muscaria* and *A. pantherina*, but American specimens of *A. solitaria* may contain a closely related constituent.

Peptide Toxins

The chemistry and toxicology of the peptide toxins of *A. phalloides* have been studied extensively in Germany. This species of deadly *Amanita* was considered to be absent from the North American flora, but after developing chromatographic procedures for detecting the amanita toxins, investigators at the University found that a mushroom which occurs infrequently in the Pacific Northwest corresponds chemically and mycologically to *A. phalloides*. Application of chromatographic and pharmacologic techniques have revealed the presence of amanita toxins in carpophores of *Galerina autumnalis*, *G. marginata*, and *G. venenata*. These results provided the first reliable explanation for the toxicity of certain *Galerina* species and the first recognized occurrence of these toxins outside the genus *Amanita*. Subsequent studies have demonstrated the production of the amanita toxins by fermentative cultures of *G. marginata*.

Norcaperatic Acid

A white crystalline compound from *Cantharellus floccosus* was observed to cause abnormal functioning of the liver in test animals. The compound was not as toxic as the amanita toxins which also effect the liver, but the occurrence of this substance was interesting since the related chanterelle, *C. cibarius*, is considered a gastronomic favorite by many people. The crystalline material was determined to be norcaperatic acid, a new naturally occurring and unusual derivative of citric acid. No trace of this acid could be detected in *C. cibarius*.

Indole Derivatives

Many indole derivatives are physiologically active, and previous investigators had reported the occurrence of the hallucinogenic compounds bufotenine and psilocybin in mushrooms, the former in *Amanita citrina* and the latter in various Mexican *Psilocybe* species. Routine studies detected the presence of bufotenine in *A. porphyria* and *A. tomentella*, and a detailed examination of *A. citrina* and *A. porphyria* for 5-hydroxytryptamine derivatives revealed the presence of bufotenine-*N*-oxide, serotonin, *N*-methylserotonin, and 5-methoxy-*N*,*N*-dimethyltryptamine. The first reported

occurrence of serotonin, a compound involved in the normal function of the central nervous system of man, from a fungus (*Panaeolus campanulatus*) was made in 1958 by a research worker at the University. More recent studies have shown the accumulation of serotonin in *P. acuminatus, P. acuminatus* f. *gracilis, P. foenesecii, P. fontinalis, P. semiovatus, P. sphinctrinus, P. subbalteatus,* and *P. texensis,* and a procedure has been developed for the quantitation of this compound.

Mushrooms in the local flora have been examined for psilocybin and psilocin, 4-hydroxytryptamine derivatives. This has resulted in the recognition of one or both of these compounds in carpophores of *Conocybe cyanopus, Psilocybe baeocystis, P. cyanescens, P. pelliculosa,* and *P. semilanceata.* Investigations have also been conducted on the biosynthesis of psilocybin in submerged cultures of *P. cubensis,* and the metabolism of this species has been contrasted with cultures of several *Panaeolus* species. Such comparative studies provide information toward an understanding of the basic reasons why some compounds, such as psilocybin, are produced in both the fruiting body and vegetative mycelium of certain *Psilocybe* species, whereas serotonin accumulates in the carpophores of *Panaeolus* species but does not accumulate in the mycelium.

The ergot alkaloids have had a longer and more significant history of therapeutic application than any other fungal metabolites. These compounds have been obtained commercially from ergot sclerotia grown on rye plants and are used extensively to relieve migraine headache and to control postpartum hemorrhage. Studies at the University have been conducted with cultures of numerous alkaloid-producing and nonalkaloid-producing strains of *Claviceps.* Success has been achieved in discovering submerged-culture conditions under which a strain of *C. paspali* will produce commercially practical yields of the desired alkaloids. In December 1965, a U. S. patent was issued on this process.

Screening Studies

A large number of mushroom species which occur in Western Washington have been examined for pharmacologic activity. Once a species is recognized as having a characteristic type of activity, studies are undertaken to isolate and identify the active chemical principle. This systematic approach has resulted in the recognition of atromentin, a constituent isolated from *Hydnellum diabolus,* as a representative of a new group of anticoagulants. Certain compounds related to atromentin are also known to have antitumor activity. These potential therapeutic activities prompted a detailed investigation of the occurrence of related diphenylbenzoquinone compounds in six available *Hydnellum* species.

A review of the occurrence of physiologically active plant constituents will frequently reveal distribution patterns of similar metabolites in related species. The addition of a chemical parameter to supplement the classical taxonomic criteria has been recognized recently to be useful in certain cases, and the area of chemotaxonomy is developing to explore these possibilities. Chemotaxonomic data can also provide significant information in the search for therapeutically useful compounds. Consequently, investigators in the College of Pharmacy and the Department of Botany have undertaken the evaluation of chemotaxonomically selected compounds or types of compounds in certain Basidiomycetes. Preliminary results have achieved varying degrees of success with species in the genera *Amanita, Inocybe,* and *Tricholoma* and in the family Hydnaceae.

Summary

The preceding discussion provides an indication of the contributions of the College of Pharmacy to biological research. It is apparent that some of the investigations approach problems of basic scientific interest but that many of the studies have applied aspects. This blend of interest is characteristic of pharmacognosy where a

(Continued on Page 83)

Soils of the Arboretum

Stanley P. Gessel*

For any land area a knowledge of soil types, soil properties, and distribution of soils is essential to proper management. In the case of an arboretum developed and used for aesthetic, demonstration, and research purposes such soils information is even more basic. The proper association between plants and soil is necessary in order to make the arboretum most successful and useful and knowledge of the soils is necessary in order to understand and solve many use problems.

Graduate students at the College of Forestry have been working over the past few years to study soil types and distribution within the arboretum in more detail than previously known. The Soil Conservation Service is normally responsible for developing systems for soil surveys on most lands within the United States, and also for carrying out the surveys, including publishing. This work is ordinarily done on a county basis and with a priority system. King County was surveyed a good many years ago and the survey was published in 1938. At that time major interest centered on agricultural, or potential agricultural lands and major urban areas were not given detailed surveys. Therefore, a tract such as the arboretum is listed as urban in the King County survey.

Using procedures similar to those employed by the Soil Conservation Service and the same classification system, graduate students have examined the arboretum in some detail. The attached map represents their appraisal of the distribution of soils over the arboretum and the following section describes the soils identified and discusses some aspects of use of each soil for arboretum purposes.

Soils and Uses

The description of the soils should be prefaced with the fact that soils are a product of the environment of any area, and that properties of any soil are determined by one or a combination of the following soil forming factors:

1. parent material—nature of rocks and geological material.
2. climate—principally temperature and water regulation.
3. age—how old the soil is.
4. organisms—the action of all life in or upon the soil.
5. topography—slope, and position on slope.

The factors act in any given area to develop a particular kind of soil which is distinguished by properties of the soil profile just as one plant differs from another. The soil unit in this instance is called a soil series and is given a characteristic name usually taken from the area in which it was first described—e.g., Everett Soil Series—Everett, Washington. A recognition of a particular soil series and an understanding of its properties then enables one to make judgments with regard to the use of the soil for a variety of purposes.

In an area as small as the arboretum we would not expect great variation in most of the soil forming factors, and hence not a great variety in soils. However, the past glacial history of the Seattle area has caused considerable differences in parent materials in local areas and hence considerable difference in soils, particularly since the soils are relatively young (about 10,000 years since last ice advance). In addition man has been a factor in some areas of the arboretum and has developed soils by garbage and land fills in low spots. The students turned up many pieces of old Seattle garbage in making the field study.

Specific Soils: These descriptions are taken partly from the King County Soil Survey but are in part based on field observations and past experience with the soils.

Alderwood Gravelly Sandy Loam

This soil is developed on glacial till and

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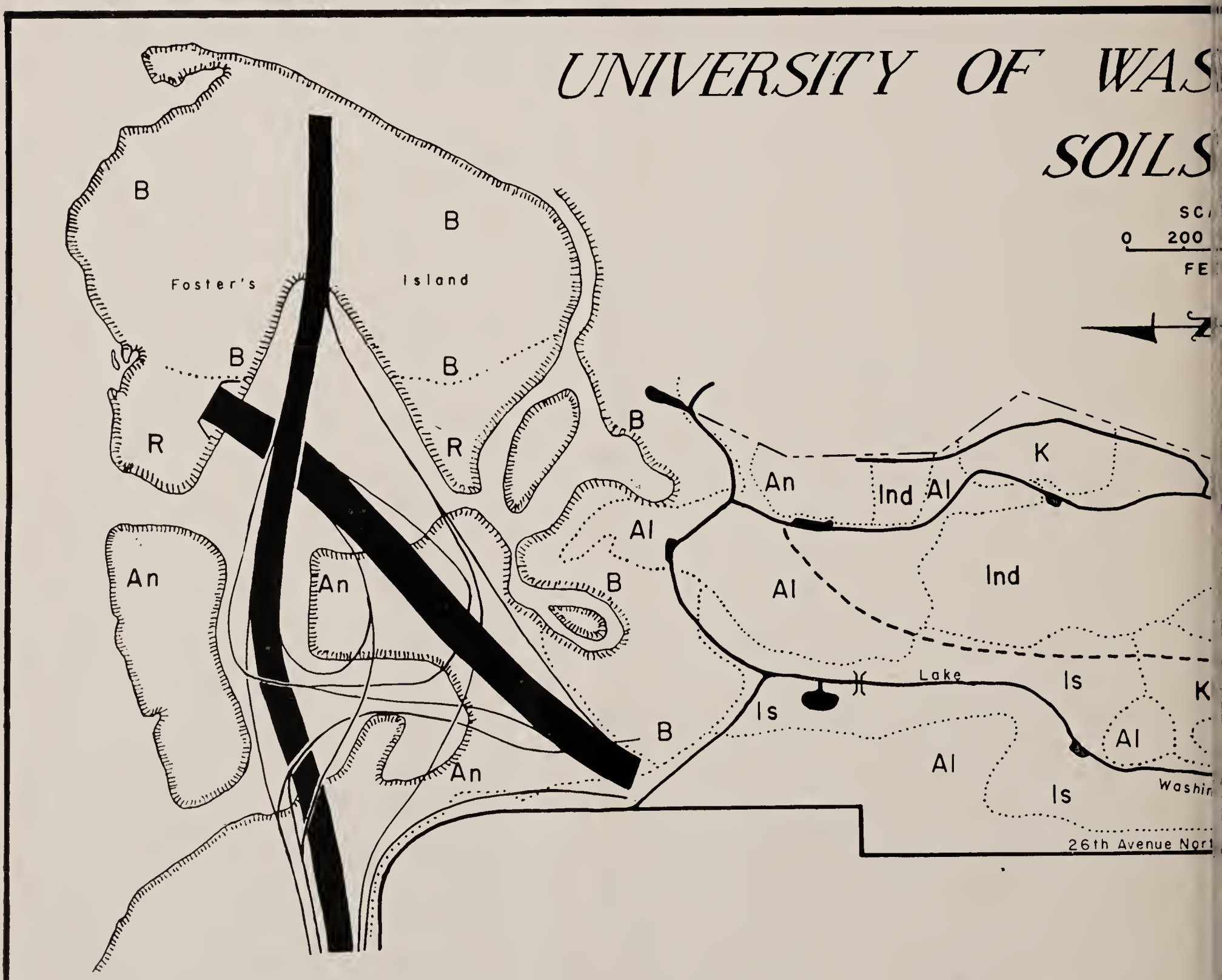
drift material, consisting of a wide variety of rocks and minerals of varying sizes. Much of the rock is granitic and therefore light colored. The till has become compacted and cemented at varying depths below the surface. When dry, the cemented till gives the appearance of concrete and is generally impermeable to roots of plants. Surface drainage is adequate but subsoil drainage is slow and the soil can become water saturated during wet periods and in depressions.

In a virgin condition, the surface is covered by a partly decomposed dark-brown organic mat several inches thick. Abruptly under this layer is a brown to pale reddish-brown friable gravelly sandy loam 12 to 14 inches thick. Round shot-like concretionary or cemented pellets of impure ironstone or manganese materials are numerous. Beneath this is the upper subsoil of mildly acid yellowish-brown gravelly sandy loam with a decreasing quantity of pellets. A lighter yellowish-gray 6-inch layer, frequently matted with roots, is usually over the indurated silica-cemented substratum that occurs at 28 to 36 inches.

Saturation in winter and spring causes yellow and brown discoloration immediately above the indurated drift, and the roots are horizontally matted because of the inability to penetrate the substratum freely. Characteristically, the surface few inches of the cemented strata has successive layers



Data Collected By:

Dalles Hughes
Ralph Monteen
Furman Irby
John Mc Coll

of thin fragmental plates. Roots penetrate to some extent between these, and reach the more softly cemented material beneath. Water likewise moves downward but apparently with difficulty, as the soils become saturated during the wetter season. The light-gray to gray material is usually sand and gravel with more or less embedded stone and boulders and extends to undetermined depths. The greater part of it is neutral, but there is a slight acidity developed at the upper surface.

Originally this soil was heavily forested with Douglas-fir, hemlock, and red cedar. It can be used for a wide variety of plants if depth to the hardpan is at least 30 inches and if soil is properly fertilized.

Bellingham Silty Clay

This soil occupies glacial basins and depressions that have been modified by erosion and deposition. Fine silt and clay sediments probaly laid down in temporarily arrested lake waters have contributed to its development.

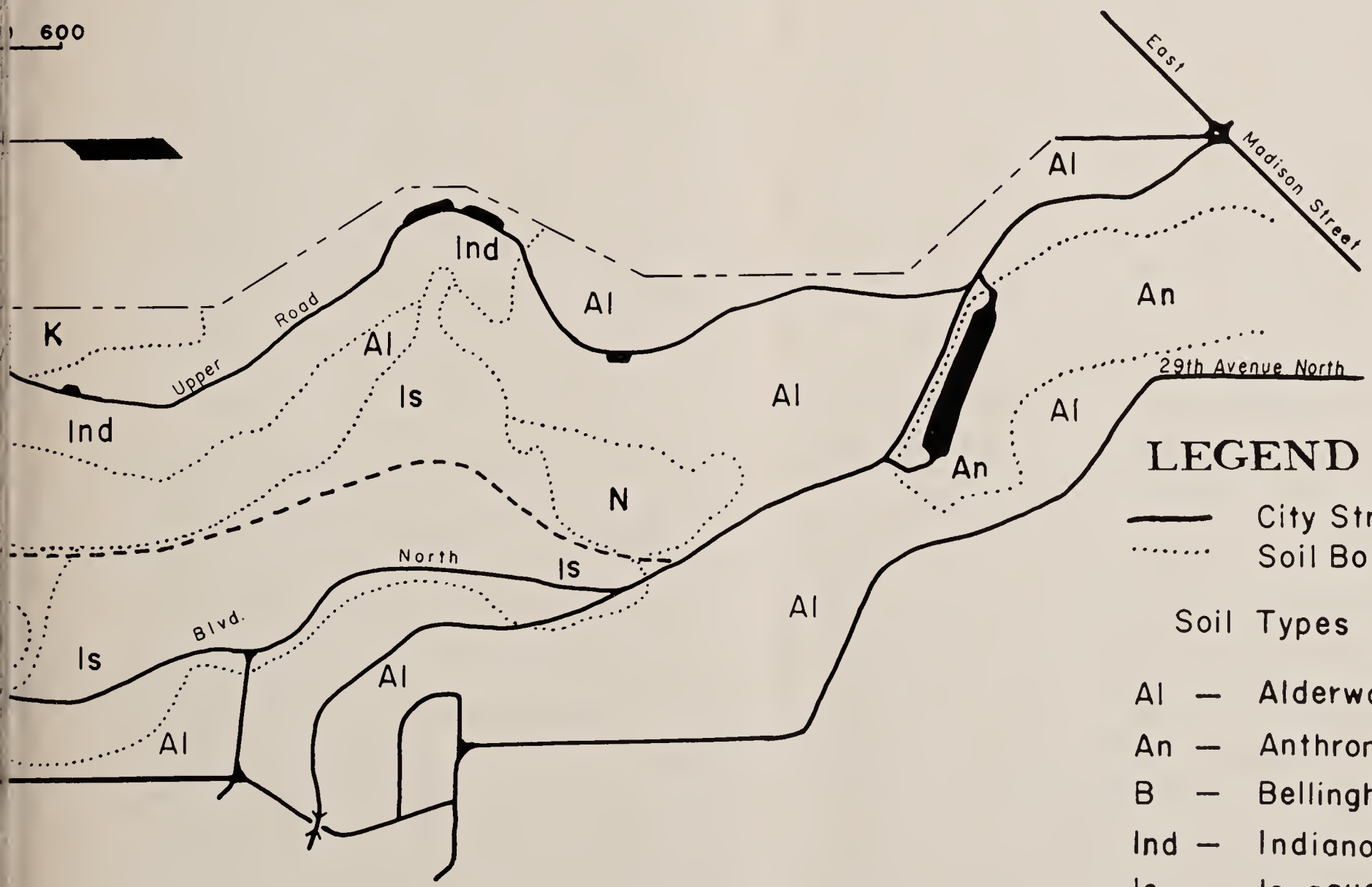
In the virgin condition, the soil is wet and waterlogged, and usually difficult to drain because of the heavy clay layers in the subsoil and substratum.

In typical occurrence, the 6 to 10 inch surface soil is moderately acid dark dull-brown to nearly black granular, highly organic silty clay. The upper subsoil is mildly acid, drab or dark grayish-brown, somewhat mealy, fairly friable silty clay

INGTON ARBORETUM

MAP

600



6-66 RSElliott

loam or silty clay. Below 18 inches are laminated strata of blueish or greenish-gray clay, silty clay, and silt, stained or mottled rusty brown and yellow with green and blue in the deeper part. These stratified deposits are very slightly acid to neutral.

This soil originally supported red cedar, spruce, hemlock and some fir, with a dense undergrowth of alder, vine maple, and willow, often with spiraea, briers, sedges, and water-tolerant grasses. Because of its topographic position and drainage it is best used for plants which will tolerate less well drained conditions. It will also need fertilization under intensive arboretum use.

Indianola Fine Sandy Loam

This soil occurs in rolling upland on eskers and kamelike sandy drift deposits. The drift upon which they developed was sorted by fluvioglacial agencies and by waters associated with, or subsequent to, the retreat of the glacier.

In virgin areas, the surface soil is covered to a depth of several inches by a dark-brown partly decomposed moderately acid organic layer. The 12 inch surface soil is a moderately acid, reddish-brown fine sandy loam containing some coarse sand grains, a considerable number of shot pellets, and occasionally small pieces of gravel. The upper subsoil to a depth of about 30 inches, is a moderately acid, yellowish-brown sandy loam or loamy sand occasionally containing some gravel. This is underlain by yellowish-gray or greenish-gray unoxidized, unassorted salt and pepper sands with a scattering of gravel. These slightly acid to neutral sands are loose and porous, without structural development. The deeper substratum frequently is stratified and becomes more gravelly. Occasional boulders are on the surface and embedded in the underlying material.

The original stands of timber, consisted largely of Douglas-fir with a scattering of hemlock. This soil is suited to a wide range of plants, but because of good drainage and low fertility does need irrigation and fertilization.

Issaquah Silt Loam

In general this soil occurs where the relief is gently sloping or with slight undulations and the parent material has been deposited by lakes or streams. Small basins and shallow abandoned drainage depressions are frequent. This soil has, therefore, developed under restricted drainage of the subsoil and substratum.

The typical surface 12 inches is a slightly acid, very dark-brown to nearly black granular silty loam. The surface soil changes abruptly to a dull yellowish-brown or reddish-brown, slightly to, very slightly acid silty clay loam layer of about 6 inches thick. The 18 to 25 inch subsoil is composed of brown, very slightly acid to neutral, stratified sandy clay, clay loam, and clayey sand that is micaceous, gritty, and highly mottled with rust brown or streaked with light grayish-brown or brownish medium gray. Rusty reddish-brown layers slightly cemented by iron are not uncommon, and occasionally thin beddings of dark mucky layers occur. These deep substrata materials are neutral to slightly alkaline and usually contain interstratified gravel layers. A scattering of gravel sometimes occurs in the lower subsoil. Because of the fine components in the soil it is fairly fertile, but use for many plants is restricted by drainage.

Kitsap Silt Loam

These are developed on eroded remnants of fine-textured lacustrine sediments, largely silt and clay, probably of glacial lake origin. The soils occur mostly marginal to the roling upand along the larger entrenched stream valleys and lakes. Their relief is generally undulating to gently sloping, but both flat and steep areas are frequent. Surface runoff is rapid, but internal drainage is somewhat restricted. The Kitsap silt loam soils are considered among the most drought-resistant soils of the area.

In virgin areas, there is a moderately to strongly acid, dark-brown, partly decomposed organic layer, 1-1/2 to 2 inches

Continued on page 82

Understanding Ecology in the Pacific Northwest

Patrick J. Cummins

Ecology, that part of biology which deals with the mutual relations between organisms and their environment, is a continual process of change. As gardeners and devotees of the University of Washington Arboretum we are constantly making ecological judgments sometimes unaware of the dynamic and integral relationships involved. The purpose of this paper is to look at plant ecology and provide a framework for your thinking about the mutual relationships between plants and their environment. These principles apply to our gardens as well as to large tracts of land.

There are certain factors inherent in the plants themselves which can be modified by their environment but which are nevertheless so strongly controlled by the individual species that they can be said to be plant factors. Among these are:

1. Basic morphology or plant form as applied to potential size and to the actual habit of their root systems as well as their crowns.
2. Age—a factor important both within and between species as it affects individual plant development and also the time ingredient affecting plant maturity.
3. Tolerance or intolerance to low levels of light intensity. Great variation between species can be demonstrated in our gardens, in the Arboretum, or upon the great forest lands of the Northwest.
4. Reproductive potential—this factor can be beneficial in natural reforestation, unimportant where regular mulching programs are carried out, and be a problem to the gardener in terms of unwanted weeds and sprouting suckers.

A review of environmental elements is helpful in understanding the wide range of factors which must be blended to achieve horticultural excellence on any size property. They can be listed as follows:

1. Light—this essential ingredient to the process of photosynthesis not only helps provide the plant sugars needed for life processes but often affects the plant's form which may be open and leggy in the shade but bushy and compact in full light.
2. Water—not only the total potential water available from the atmosphere is important, but the time at which it comes and the capacity of the soil to store it must be considered. Water can be a destructive factor in times of flood and erosion.
3. Nutrients—availability of organic and inorganic materials is often more than a matter of being present in the soil. They may be involved in a chemical form preventing them from use by the plant.
4. Temperature—each of the physiological processes which go on during the life of any particular plant has certain temperature limits (maximum and minimum) between which it can take place, and a characteristic temperature (optimum) at which it goes on most actively. The minimum, optimum, and maximum temperatures for one process may differ considerably from those of another process taking place in the same plant at the same time. Moreover, in the case of a given process, such as photosynthesis, the cardinal temperatures may vary rather widely in different species. Differences in temperature in different parts of the world and at different altitudes constitute what is probably the most important factor in determining what plants will or will not grow in a given region.

*Mr. Cummins is Forester with the Weyerhaeuser Company.

5. Growing space—there must be room for the root and crown systems to develop. If adequate room is not provided for future growth, crowding results and thinning or reorganization of plant material is necessary.
6. Air—the source of oxygen and carbon dioxide used in respiration and photosynthesis.
7. Wind—air movement can become violent and damage many plants severely and when combined with dryness may defoliate and/or wilt a plant.
8. Competition—this could be listed as a plant factor but in essence is the resulting response of plants to the complex combinations of environmental elements. Those responding best not only survive but crowd out others.
9. Time—the key to ecological development particularly in regard to plant succession.

All the environmental factors act in combination as well as independently of each other.

Plant succession, particularly as it involves the change of plant communities with time in a trend toward a self-perpetuating or climax vegetative type is a special field of study which is fascinating to all keen observers of the out-of-doors. This succession is arrested at an early stage in the rough lands surrounding our cities as they are changed to residential and industrial uses. Agricultural lands, usually cropped on an annual basis, are intentionally exempted from the plant succession factor. Forest lands, especially those dedicated to the perpetual cropping of timber on sixty to one hundred year rotations, make economic use of plant succession principles as they affect the method of starting a new crop. In wilderness areas of our national forests and in most of our national parks, ecological forces are permitted to act over the centuries usually needed to affect climax vegetative types in forests and meadows.

A plant's response in growth, flowering habit, general vigor, and survival will vary between and within species for each environmental element and interactions between elements. The complexity of this statement can be summarized and applied to our gardens and to the Arboretum. Leaving out the aesthetic value of artful placement and combination of plant material, have you noticed how gardens vary in horticultural quality? The Arboretum is an unusually high quality combination of native and introduced plant material, skillfully blended, and planted and maintained with the environmental elements given careful consideration. Art and ecology are the primary ingredients in good landscape design. We must know the environmental elements in our gardens and know the response of the various species so well that they can reach near optimum conditions. The Arboretum is an excellent place to observe the forces of ecology acting on a wide variety of plant material.

An understanding of plant ecology will lead to rational rather than emotional thinking about conservation itself. The meaning of conservation, say ecologists, is not preserving everything but working to keep things in balance. The physical requirements of society must be met from the resources of the natural world, but met in a way which, while fulfilling the needs of the present, will assure the maintenance of reserve for the future.

"Life," says a fine Greek adage, "is the gift of nature; but beautiful living is the gift of wisdom." Not all of us can study ecology intensively, but we can all walk under trees older than our nation's history, on a forest floor rich with the things that sustain life, or fish along a conifer shaded stream or bird-watch along the edge of forest land. A natural area is a living library, where we can see, hear and taste life in action, and feel ourselves a part of all creation.

Weed Control in New Landscape Plantings

Arthur Bing

One of the big problems in landscape plantings is weed control. Weeds compete for water and fertilizer with the ornamental plants put in the ground by landscapers. Water shortages these past few years have made this a critical problem. When large weeds hide the ornamentals, architects and inspectors find it difficult to check the number of plants in good condition at the end of the normal maintenance period. Finally a landscape planting full of weeds is unsightly.

We have been studying the effect of various mulch materials combined with the use of herbicides to control weeds in landscape plantings. Some herbicides give adequate weed control for a one-year period when used on nursery plantings. However, one of the problems with using an herbicide on slopes is that the herbicide or the soil treated with the herbicide is readily moved by a surface run-off of water. Mulches partly control the surface run-off and, if used in sufficient thickness, control weeds to a certain extent. By using herbicides with the mulch, it is possible to use considerably less mulching material, so that the saving on mulch is greater than the cost of the herbicide.

Experiments have been carried out using mulch materials such as peat moss, salt hay, cocoa hulls, cellulose fiber, asphalt emulsion, peanut hulls and wood chips. All these mulch materials have been effective when used in thin layers on top of soil treated with herbicide, or when the herbicide was incorporated with the mulch material before application to the soil. The herbicides that have performed quite effectively and for long periods are Simazine, Casoron and Diuron. Casoron in particular works better under mulch materials than when used alone. Simazine and Diuron have practically the same herbicide effect when used alone or with the mulch.

The control of surface run-off by all the mulches mentioned, except asphalt, is primarily due to the more porous condition of the soil; water readily percolates through the soil avoiding sheet erosion. The asphalt emulsion, however, forms an impenetrable layer and the water runs off the top. This mulch would be good for short slopes but for long slopes the water may develop sufficient velocity to get under the asphalt and pull it free.

Experiments have been carried out on a variety of nursery plants including privet, juniper, yews, azaleas, euonymus, red stem dogwood, hawthorns, roses, fragrant sumac, pine, box leaf holly, and Hall's honey suckle. These plants have shown considerable tolerance to the herbicide mulch treatments.

Main considerations in the use of a mulch material are availability, cost, and ease of application. Because of the cost of applying mulch materials, we have tried the use of cellulose fiber which can be put in water with the herbicide and sprayed onto the areas. Some landscapers have the equipment for putting on chopped hay. The application of the cellulose fiber with herbicide have given long lasting weed control, and the mulch is still in good condition after one year. Salt hay on top of soil treated with herbicide also is very effective. Another consideration in some metropolitan areas is that the mulch material should not be too readily inflammable. On highway landscape projects lighted cigarettes thrown out of cars into the mulch can cause a serious fire.

Herbicides alone or, in some instances, combined with mulch can be very effective in controlling weeds.

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The Arboretum Bulletin

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To keep membership in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears will be dropped and The Bulletin will be discontinued.

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University of Washington Arboretum
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I hereby apply for membership in the Arboretum Foundation and remittance for same is enclosed to cover dues for the next succeeding 12 months.

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Arboretum Nature Trail

On July 24 the Secretary of the Interior, Stewart L. Udall, announced a series of grants from the Land and Conservation Fund to be used in cities across the country to develop a variety of urban trails. To meet urgent recreation needs, twelve urban areas will receive a total of $367,436 from the Contingency Reserve of the Land and Conservation Fund. The states will match the federal grants with equal amounts of money.

Forty-five thousand dollars has been granted to Seattle to develop a pedestrian water-front trail along the Lake Washington Ship Canal and will be matched from a trust fund held by the University of Washington. The possibility of creating a nature trail and tentative plans were described in the 1965 Summer issue of The Arboretum Bulletin (Vol. 28, No. 2, page 35). The plans were designed by Eric W. Hoyte, University Landscape Architect.

A proposed cedar-plank trail will run through a cattail marsh offering opportunities for wildlife observations and other nature studies. Bridges will connect the new trail with existing trails on Foster Island and those through the Arboretum. Part of the grant money will be used to improve existing trails and also to improve pedestrian access to all parts of the Arboretum, including canoe access around Foster Island.

The boardwalk section will include two pedestrial floating bridges with sufficient clearance for canoes. The trail leading to the north end of Foster Island will be improved and the south end of Azalea Way will be improved and connected to East Madison Street. Construction will begin in the fall and it is expected will be completed by next summer.

The trustees of the 1400 acre Morton Arboretum, Lisle, Illinois, have announced the appointment of a new Director to succeed Mr. Clarence E. Godshalk, who, on

September 27, 1966, will have served the Arboretum for forty-five years.

He will be Dr. Marion T. Hall, a native of Texas, until recently Director of the Stovall Museum of Science and History, and Professor of Botany at the University of Oklahoma, Norman, Oklahoma. Prior to that, he was botanist six years at the Cranbrook Institute of Science, Bloomfield Hills, Michigan; then, from 1956 to 1962 head of the Department of Botany at Butler University, Indianapolis, Indiana, and Acting Director of the University of Michigan Botanical Garden at Ann Arbor for one year.

We must congratulate the Morton Arboretum for having secured a man with such wide experience for this important position and wish him all success in his new location and work. He may also be remembered as the author of an article "Know Your Cultivated Junipers" which was published in this *Bulletin*, Spring, 1957.

Some of Our Favorites ☆

☆ *Won't You Send Us Yours?*

Five or six years ago Lillian (Mrs. Lewis J.) Inkster gave an eight-ten inch seedling *Pterostyrax hispida* to an eager, but novice, gardener. That small seedling tree has now grown to approximately fifteen feet tall and has provided a constant source of interest and enjoyment in our garden. This year it has bloomed and fruited for the first time.

Commonly called the Epaulette Tree,* this rather rapidly growing tree quickly adapted itself to its new environment in a raised bed adjacent to the patio, and with the smallest amount of attention on our part has become a delight. It is an openly erect tree with horizontally ascending branches forming a somewhat pyramidal shape. The obovate-ovate leaves, narrow at the base and pointed at the tip, are from three to seven inches long and four to five inches wide with denticulated edges. They are a soft green on the upper surface and a greyed green below. Both the under surface and the prominent heavy veins appearing in the under surface are covered with soft, short fuzzy hairs. The fragrant creamy-white blossoms which appear in June hang in panicles five to ten inches long. The individual flowers are small, the corolla being approximately one-third of an inch long flaring slightly, with ten stamens longer than the corolla and a slender style extending beyond. Looking up into the tree from below one is reminded of row upon row of tiny ballet dancers.

The ballet dancers have been displaced by winged fruits which are actually one to two seeded nuts one half inch long which are covered with short bristly hairs. They hang in clusters in a vertical fashion from the horizontal branches. Viewed from inside the house and with sun filtering through the leaves, those fuzzy, golden colored fruits are a delightful picture. Even the squirrels that daily play along the top of the fence have discovered them. One hopes that enough of the fruits will remain after the leaves yellow and drop so that we can enjoy the tree's winter dress also.

The *Pterostryax hispida*, a native of China and Japan, is closely related to the Halesia and is distinguished from it by the drooping flowers and fruits. It attains a height of approximately fifty feet. While it is maturing we shall continue to enjoy the welcome shade it provides on the patio, as well as for the rhododendrons with which it is underplanted, and to delight in its dainty blossoms and fruits. We are grateful to Mrs. Inkster for broadening our horticultural horizons.

Doris (Mrs. Joseph P.) Butler*

*J. A. Witt, *University of Washington Arboretum Bulletin*, Summer 1962: pp. 48-49

*Mrs. Butler, Chairman of the Arboretum Foundation Unit Council's 19th Annual Fall Plant Sale at the Arboretum welcomes contributions of plant material. If you desire information or wish to special order material, call her at LA 4-5583.

The Arboretum Foundation Unit Council

ANNUAL FALL PLANT SALE

Wednesday, October 5, 1966

9:00 a.m.

The choicest of Plant Material will be offered
—Rhododendrons, Azaleas, Ground Covers,
Trees, Shrubs, Ferns, Herbs, Alpines
etc.

A Letter from the President

(*Continued from Page 59*)

From the foregoing, you will observe that the Unit Council activities, including the plant sales, have produced over $55,000.00 in the past ten (10) years, of which $35,000.00 has been spent for expenses and Arboretum projects and there is left over $20,500.00 (plus interest) in a savings account to be used in the future as the Board of Directors may direct, subject to the Budget Review Committee.

The usual request was made this year to the University of Washington's Administration for permission to hold the plant sale again this year in the Arboretum. That request was granted and in the letter from the Vice-President of the University of Washington granting the request, he said:

> "I am very happy to inform you that permission is granted for the Foundation to hold its 1966 Annual Plant Sale in the Arboretum"

The Foundation has set October 5th for the date of that sale, which is the customary date and the sale will take place *in the Arboretum* on that date. I urge your undivided support for that sale.

Yours sincerely,
FORD Q. ELVIDGE
President

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (May 25 through August 16, 1966): *Contributing*—Howard F. Keeler. *Sustaining*—C. Hilary Obert. *Annual*—Mr. & Mrs. Frederick H. Ameluxen, Mrs. Emil E. Balut, Mrs. Walter W. Baz, Mr. & Mrs. John H. Bergen, Mr. & Mrs. Paul W. Bradfield, Mrs. William R. Burr, Mr. & Mrs. Roger N. Christiansen, Mrs. Robert J. Cunningham, Mrs. Howard Daugherty, Mrs. William B. Dell, Mrs. Thomas E. Douglas, Mrs. E. A. Fay, Mrs. Reynold A. Freidin, Mrs. Evan D. Graham, Mrs. Thomas G. Hammond, Jr., James Hutchinson, Mrs. W. Ipsen, Larry La Clair, Mrs. G. C. Levich, Dr. and Mrs. Clifford G. Lewis, Mrs. William H. Martin, Mrs. Raymond R. Meyer, Capt. & Mrs. J. R. Middleton, Ronald J. Poff, Col. & Mrs. T. A. Rathje, Mr. & Mrs. Howard J. Ricketts, Dr. & Mrs. J. N. Roehr, Mrs. W. B. Slabaugh, Mrs. Milton E. Terryll, Mrs. M. R. Wallace, Mrs. William L. Wilton, Mrs. Frank N. Young.

We are also grateful to the following who have increased their membership dues to: *Supporting*—David J. McNett. *Sustaining*—Mrs. Samuel L. Barnes.

Arboretum Report

(Continued from Page 62)

James Wray, hired as truck driver in December to replace R. C. Longfellow, who had been with us for about nine year, left in July; to fill this vacancy Allen Spencer was promoted from groundsman. Mrs. Margaret E. Harper, diligent secretary for more than six years, left in July with regrets on both sides, to be married and live in Spokane, Wash. Temporarily, her place has been taken by Dianne B. Bosso, but unfortunately this will also be terminated shortly by marriage and a move to Oregon.

Weather and Flowering

The spring and early summer of 1966 will long be noted here for the remarkable and often superb flowering of almost all our major plant collections, and also of some unusual individual specimens. No one now on the staff can remember such profusion on so many different kinds of plants in any previous year, although we have had some distinctly flowery seasons during the past two decades.

The display began early in the spring and was very noticeable in the brilliance of the oriental quinces (*Chaenomeles*) in early April. These were followed by the earlier magnolias, especially *M. denudata* and the hybrid forms of *M. Soulangiana*, the camellias, crab apples, Japanese cherries, dogwoods, many though not all of the rhododendrons (the Loderi hybrids and 'Azor' seedlings were especially fine), the azaleas, wisterias, *Clematis montana*, the mock oranges (*Philadelphus*) so heavily laden with bloom in June.

Of individual plants of special note, these flowered for the first time in the Arboretum. *Magnolia Dawsoniana*, very sparsely in early April, planted in Loderi Valley, April 1953, now about 32 ft. tall; *Michelia compressa*, an evergreen Japanese tree obtained from a nursery in Oregon and planted in May, 1961; *Fraxinus longicuspis*, a flowering ash of the *Ornus* group, raised from seeds received from Japan in 1950, planted out Dec. 1956; *Cercis racemosa*, from central China, imported from England as plants in 1959, set out Dec. 1960. *Phillyrea decora*, a handsome broad leaved evergreen shrub from the southern U.S.S.R. and W. Asia, blooming in early April.

The following flowered freely for the first time here. *Cornus florida* var. *Urbiniana*, introduced as seeds from N.E. Mexico by Dr. F. G. Meyer (now of the U.S. National Arboretum) in 1948; *Davidia involucrata*, the Dove tree, 26 years old from seeds; *Magnolia* 'Merrill', received from the Arnold Arboretum, Boston, as scions in 1954, and *M.* 'Slavin's Snowy', from Rochester Parks Department, N.Y., in 1957. These two hybrids are similar in the chalice form of their flowers and suggest a hybrid between *M. denudata* and *M. Kobus*. *Wisteria floribunda*, raised from seeds in 1942, surprised us by covering a 60 foot tall western red cedar with its tassels of lavender flowers in May; planted in 1951 it had hardly shown itself until this spring. *Rosa moschata*, received as seeds from the University of California Botanic Garden in 1946 and planted ten years later, performed in similar fashion in early July. All in all it has been a wonderful season for both staff and visitors, perhaps due in large measure to the warm, sunny weather in July and August, 1965, and the more than 1000 hours of sunshine received between June 1 and Sept. 30. We hope the fall coloring will be equally spectacular.

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The Strybing Arboretum

(Continued from Page 65

woods and each species is clearly marked with its scientific and common name. Here is where the In Service Training Program for school teachers began in 1962. The purpose of this program is to conduct a series of lectures and field trips to assist the teachers in the presentation of nature study classes at the grade school level. Its aim is to provide an opportunity for the pupil to become familiar with the living things which inhabit the earth's surface and thereby gain an appreciation of their importance to our culture and economy. There are two courses presented each year. Each one consists of fifteen two hour meetings which are equally divided between lectures and field trips through the Arboretum. Their content includes botany, ecology, and horticulture as well as additional information about plants and animals, their histories, native habitats, legends, and literary references. Since 1962, 310 grade school teachers, 60 girl scout leaders, 20 compensatory education teachers, and 30 adult volunteers have completed the course. Through them we have reached over 30,000 children with this program since 1962.

There are still twenty acres of undeveloped land adjacent to the California section which were not considered under the master plan. Some 50 years ago, this remaining portion of the Arboretum was planted to Monterey Pines (*Pinus radiata*). The land is gently undulating with an undercover of native grasses and a loose sandy soil. After careful consideration, it was felt that this area should be utilized as a nature trail to supplement the existing Redwood Trail. It is not our intention to landscape this area in the popular sense and there will be no manicured lawns nor brilliant display of exotic plants, but rather a natural planting of California native trees, shrubs, and herbs with foot trails following the natural contours to each point of interest. Under the guidance of trained

instructors, a Nature Trail can bring the natural world closer to the visitor, young as well as old, by demonstrating in a systematic way how living things are dependent upon one another and how they are influenced by the habitat in which they live. This phase of education cannot be easily demonstrated in a class room, but out of doors, a properly organized Nature Trail would show, in a dynamic manner, the inherent unity that prevails between all living organisms.

There is always something of interest to be seen in the rock garden. Its principal feature is the James Noble collection of dwarf conifers. Rare and unusual dwarf pines, cedars, firs, and cypress amaze the visitor who, more often than not, believe them to be artificially dwarfed in the bonsai tradition. A full account of this section was published in a recent issue of the University of Washington Arboretum Bulletin.*

The Hall of Flowers is a splendid addition to the Arboretum and, with the Demonstration Gardens, constitutes the San Francisco County Fair area. Within the building is the office of the Strybing Arboretum. While the Hall of Flowers was designed primarily for flower shows, civic and cultural organizations are allowed to use the facilities provided they do not conflict with scheduled flower shows and garden club meetings. During the fiscal year of 1965-66, the total attendance was over 100,000 and represented 362 separate events.

In the last six years, great progress has been made in the Arboretum and this has been largely due to the interest and support which has been received from the Strybing Arboretum Society whose members have contributed generously, not only of money, but also knowledge and skill. Now that the Master Plan has been completed we look forward to the refinements which can now be carried out in the newly prepared areas in the Arboretum.

*Winter 1963

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Soils of the Arboretum

(Continued from Page 72)

thick. This layer is frequently bound together by fine surface roots in the more moist areas. Where typically developed, the surface soil below this to a depth of about 12 inches is moderately acid, dull-brown or grayish-brown and faintly reddish heavy silt loam that is plastic when wet, but crumbly when dry or moist. It contains an abundance of rust brown shot-pellets of buckshot to pea size. The upper subsoil is drab-yellow and brown mottled grayish-brown silty clay loam, containing fewer shot pellets than the surface soil. It is mildly acid. The lower subsoil between 24 and 40 inches is a slightly acid brownish-gray clay streaked with yellow and rusty brown, and faintly laminated. This is underlain by blueish or slate-gray horizontal compact laminated clay with seams or thin layers of silt and very fine sand. This clay is slightly acid to neutral and continues to undetermined depth.

This soil originally supported Douglas-fir, hemlock, and cedar, with considerable alder, willow, maple and deciduous brush. It is one of the most fertile and most productive upland soils in western Washington. It is suited to a wide range of plants and presents less use problems for an arboretum than any other local soil.

Norma Fine Sandy Loam

These soils occupy glacial basins and depressions that have been modified by erosion and deposition. The surface soil is very dark brown, highly organic and moderately acid, often being gritty, and is usually about 10 inches deep. The surface few inches in many places contains a large quantity of finely divided mucky organic matter. The upper subsoil is slightly acid to neutral, lighter brown or dull brownish-gray, slightly gritty silt loam or fine sandy loam, mottled with yellow and brown. It is underlain below about 24 inches by stratified sand and some gravel and occasional heavier textured layers. These layers are light gray mottled with yellow, brown,

and other iron stains and are slightly acid to neutral. Because of the underlying hardpan and the poor drainage, these soils have a restricted use even though the surface is higher in organic matter.

Rifle Peat

This occurs in flat bottom positions or swampy areas of stream bottoms and marginal to lakes.

In a representative area, the 16-inch surface soil is a moderately acid granular decomposing dark reddish-brown woody peat. Roots and woody debris are in the surface few inches, and under this, fibrous mat rotting wood fragments are abundant. Between 16 and 48 inches is a moderately acid dark-brown peat, more thoroughly decomposed and colloidal than the material above, but containing some fibrous woody fragments throughout, and some sedge fibers at the lower limits. At 48 inches and extending to 70 inches, is a fibrous-matted mildly or slightly acid peat composed of compressed sedge, reed, and root remains embedded in colloidal material. Below this, is more highly colloidal organic material, consisting largely of greenish-brown to very dark-brown or black sedimentary peat. A substratum of mineral soil material occurs at extremely variable depths.

These soils originally supported red cedar, hemlock, spruce, alder, vine maple, cottonwood, and dense undergrowth of willow, elderberry, dogwood, spiraea, bracken fern, and other brush and shrubs. When properly drained they are fertile and can be used for a wide range of plants.

Anthromorphic Soil

This is a man-made soil, consisting of a mixture of rubbish fillings and other soil material of various origins and characteristics, transported from other places, overlaid with a thick layer of dark-colored loam. Depending upon the mixture of fill and garbage, and the length of time since active filling, these soils can be very fertile and are adapted to a wide range of plants.

We hope this report represents only the first step in making a knowledge of soil properties and soil distribution a more useful management tool in the University of Washington Arboretum. We hope to make more specific soil studies in the arboretum and determine chemical and physical properties of each soil and relate these properties to plant performance on the particular soil or to problems which develop in the arboretum.

Biological Research at the Univ. of Wash. College of Pharmacy

(Continued from Page 66)

major factor for consideration is always better therapeutic utilization of natural resources. The active research program has been conducted by three persons at the professorial level and a number of graduate students. Since 1960, the results of their efforts have been published in approximately fifty articles in the scientific literature.

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